MAKING MODERN LIVING POSSIBLE

User Guide

Domestic heat pumps

DHP-A Opti
DHP-C Opti
DHP-C Opti W/W
DHP-H
DHP-H Opti
DHP-H Opti Pro/Opti Pro +
DHP-L
DHP-L Opti
DHP-L Opti Pro/Opti Pro +

The English language is used for the original instructions.
Other languages are a translation of the original instructions.
(Directive 2006/42/EC)

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1 Foreword

Buying a heat pump from Danfoss is an investment in a better future.

A Danfoss heat pump is classed as a renewable energy source, which means that it is considerate of our environment. It is a safe and convenient solution that provides heating, hot water and, in certain cases, cooling for your home at a low cost.

We thank you for the confidence that you have shown in us by buying a heat pump from Danfoss . We hope that you will benefit from it for many, many years to come.

With best wishes

Danfoss heat pumps

2 Safety precautions

2.1 Important information

Caution	The front of the heat pump must only be opened by qualified installers.
Caution	This product is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge unless they have been given supervision or instructions concerning the use of the product by a person responsible for their safety.
	Children are not permitted to play with the product.

The system can be considered maintenance-free but certain checks are necessary.

Contact your installer for any service work.

2.2 Installation and maintenance

Caution	Only qualified installers may install, operate and carry out maintenance and repair work on the heat pump.
Caution	Only qualified electricians may modify the electrical installation.
Caution	Only qualified refrigeration technicians may work on the refrigerant circuit.

2.3 System modifications

Only qualified installers may carry out modifications on the following components:

- The heat pump unit
- The pipes for the refrigerant, brine and water
- The power supply
- The safety valves

Do not carry out construction installations that may affect the operational safety of the heat pump.

2.4 Safety valves

- Never block the connection to a safety valve's overflow pipe.
- The following safety precautions apply to the hot water circuit's safety valve with corresponding overflow pipe: Water expands when it is heated, which means that a small amount of water is released from the system via the overflow pipe. The water that exits the overflow pipe can be hot! Therefore, allow it to flow to a floor drain to prevent any risk of burning yourself.

3 About your heat pump

3.1 Heat pump components

The heat pump is a complete heat pump installation for heating and hot water. Certain models have an integrated water heater. Using the TWS (Tap Water Stratification) technology, more effective heat transfer and efficient layering of the water in the water tank is achieved.

The heat pump is equipped with control equipment, which is operated using a control panel.

Heat is distributed throughout the house via a water-borne heating system. The heat pump supplies as much of the heat demand as possible before auxiliary heating is engaged and assists.

The heat pump consists of five basic units:

1. Heat pump unit with compressor, heat exchanger, circulation pumps for brine and heating systems, valves and safety equipment.
2. Water heater
3. Exchange valve or shunt valve that the heated water either passes through to the heating system or to the water heater depending on whether heating or hot water is to be produced.
4. Auxiliary heater with an electrical heater installed on the heating system's supply line.
5. Control equipment.

3.2 Outdoor and defroster function

Applies to DHP-A Opti.

DHP-A Opti are equipped with an outdoor unit that uses air as a heat source down to -20°C. The outdoor unit has a coil that uses brine to recover energy from the outside air. During normal operation the coil becomes cold as energy is lost through the exchange of heat. In humid air conditions it may build up a layer of ice. DHP-A Opti has an automatic function to defrost the coil by reusing the heat energy produced. When required, a defrosting sequence is triggered. The defrosting sequence is described as follows:

- The defrosting sequence starts when the temperature of the brine reaches its set parameter for defrosting.
- The compressor is stopped so that the defrosting sequence does not load the compressor unnecessarily. But the compressor is not stopped when it produces hot water because the water heater is cooled during the defrosting sequence. The fan on the outdoor unit is stopped to reduce the duration of the defrosting sequence.
- The shunt valve in the heat pump opens so that warm brine from the defrosting tank is mixed with the cold brine circulating to the outdoor unit. The mixture has an approximate temperature of 15°C.
- The brine, heated to 15°C, melts the ice layer on the coil. At the same time, the brine liquid cools due to heat exchange.
- When the brine is no longer cooled to temperatures below 11°C the coil is assumed to be sufficiently defrosted.
- The shunt valve closes the flow of warm brine from the defrosting tank.
- Operation returns to normal.

3.3 Speed (rpm) controlled circulation pumps

Applies to certain heat pump models only.

A heat pump requires optimum conditions in both the heating system and brine circuit in order to run as efficiently as possible. The temperature difference between the heating system's supply line and return line must be between 7 and 10°C. For the brine circuit a temperature difference of 3°C between the input and output line applies. If the differences are larger or smaller than the quoted values, the heat pump will not work at 100% efficiency and savings may be reduced.

A heat pump with speed-controlled circulation pumps ensures that the required temperature differences are maintained. The control equipment detects if the balance is wrong and increases or decreases the speed of the circulation pumps as necessary.

3.4 HGW technology

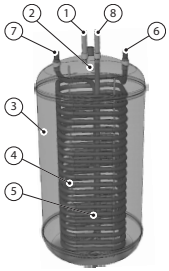
Applies to certain heat pump models only.

HGW technology is a new and unique method of water heating.

During heating of the heating system water, a small proportion is diverted through an additional heat exchanger and is used to heat the domestic water in the water tank. A shunt valve controls the flow between the hot water and the heating system.

3.5 Water heater

Danfoss heat pumps DHP-H and DHP-C are supplied with an integrated 180 litre water heater. They are equipped with a TWS coil, which results in more effective heat transfer and more efficient layering of the water in the water heater.



1 Tap hot water
2 Top temperature sensor
3 Water heater
4 TWS coil
5 Start temperature sensor
6 Supply line to TWS coil
7 Return line from TWS coil
8 Cold water line

Hot water production is prioritised over heat production.

The temperature of the hot water cannot be adjusted. Hot water production does not stop at a preset water temperature; it stops when the compressor's operating pressure switch reaches its maximum pressure. This corresponds to a hot water temperature of approximately 50–55°C in normal conditions.

To prevent the build up of bacteria in the water tank, the temperature of the water is increased at regular intervals using the integrated electrical heater (anti-legionella function). The factory-set time interval is seven days (can be adjusted). When the anti-legionella function is active, the heat pump produces hot water until the temperature for the start temperature sensor (5) has reached 60°C.

In the control system's TEMPERATURE menu, the temperatures that are measured and calculated for the hot water and heating system supply line are displayed. The current temperature of the top temperature sensor (2) and the temperature of the supply line during heating and hot water production are displayed. The temperature of the supply line often exceeds the maximum permitted hot water temperature, usually during hot water production.

The hot water tanks for DHP-A Opti differ from the other heat pumps as the function for defrosting the outdoor unit is different.

3.6 Auxiliary heating

If the heat demand is greater than the heat pump's compressor capacity, the immersion heater engages automatically in operating mode AUTO. The electrical heater is made up of an electric heating element on the supply line that has two outputs, AUX. HEAT 1 and AUX. HEAT 2, and can be controlled in three steps. DHP-A Opti has three outputs, AUX. HEAT 1, AUX. HEAT 2 and AUX. HEAT 3 and output can be controlled in five steps.

	DHP-H, DHP-L, DHP-C		DHP-A Opti	
	230V	400V	230V	400V
Step 1	1.5	3	1.5	3
Step 2	3	6	3	6
Step 3	4.5	9	4.5	9
Step 4				12
Step 5				15
Step +4				12
Step +5				15

Tab. 1: Immersion heater output in kW

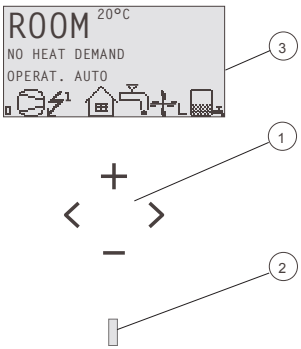
The two power steps, step 4 and step 5 for DHP-A Opti cannot be activated when the compressor is running. Immersion heater step: +4 and +5 can be connected when the compressor is running and must only be selected on the condition that the building where the heat pump is installed has a large heating demand and the building's electric installation is suitable for high current consumption. In the event of an alarm, the immersion heater engages automatically on the condition that operating mode AUTO is selected and that at least one additional step is permitted.

4 Control system

The heat pump has an integrated control system which automatically calculates the heat demand in the house to ensure that the correct amount of heat is produced and emitted when necessary.

The control system is operated using a keypad and information is shown in a display and by an indicator.

The information in the display and menus will vary depending heat pump model and connected accessories.



1 Keypad
2 Indicator
3 Display

4.1 Keypad

+	Plus sign used to scroll up a menu or increase the values.
-	Minus sign used to scroll down a menu or reduce the values.
>	Right arrow used to select a value or open a menu.
<	Left arrow to cancel selection or exit a menu.

4.2 Indicator

The indicator at the bottom of the control panel has three modes:

- Not lit means that the heat pump is not powered.
- Green continuously lit, means that the heat pump has power and is ready to produce heat or hot water.
- Flashing green light, means an active alarm.

4.3 Display

The display shows information about the heat pump's operation, status and alarms.

Symbols that show the heat pump status:

Symbol	Meaning
	COMPRESSOR – Indicates that the compressor is in operation.
	LIGHTNING BOLT – Indicates that the immersion heater is in operation. The number indicates which additional step is activated.
	HOUSE – Indicates that the heat pump produces heat for the heating system.
	TAP – Indicates that the heat pump produces heat for the water heater.
F	FLOW SENSOR – An F indicates that there is sufficient flow.
	CLOCK – Indicates that tariff control is active.
	TANK – Indicates the level of hot water in the water heater. When hot water is produced, this is indicated by a flashing icon for the tank. A lightning symbol next to this symbol indicates peak heat charging (anti-legionella function).
	SQUARE – Either indicates that the operating pressure switch has deployed, or that the pressure pipe temperature has reached its maximum temperature.
	DEFROST – Displayed when defrosting is active (applies to DHP-A Opti).
	FAN – Displayed when the fan is active (applies to DHP-A Opti). L = Low speed, H = High speed
	COOLING – Displayed if cooling is produced. A = Active cooling.

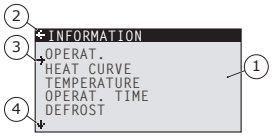
The following operating information may also appear:

Message	Meaning
ROOM	Shows the set ROOM value. Standard value: 20°C. If the room sensor (accessory) is installed it shows the actual temperature, while the desired indoor temperature is shown in brackets.
START	Indicates that there is a need for heat or hot water production and that the heat pump will start.
EVU STOP	Indicates that the additional function EVU (Elektrizitätsversorgungsunternehmen) is active. This means that the heat pump is off as long as EVU is active.
NO HEAT DEMAND	Indicates that there is no demand for heating or hot water production.
HEAT PUMP START -- XX	Indicates that there is a need for heat or hot water production and that the heat pump will start in XX minutes.
HEAT PUMP +ADD.HEAT	Indicates that heat production is active with both compressor and immersion heater.
START_MIN	Indicates that there is a demand for heating or hot water production but that a start delay is active.

Message	Meaning
ADD. HEATER	Indicates that there is an auxiliary heater demand.
COOLING	Displayed when passive cooling is produced.
ACTIVE COOLING	Displayed when active cooling is produced..
DEFROST X(Y)	Displayed when defrosting is active. X shows the actual temperature reached. Y shows at which temperature defrost is complete (applies to DHP-A Opti).

4.4 Main Menu

The display's INFORMATION menu is used to set and adjust the heat pump functions and is opened by pressing the left or right button. The menu has the following appearance:



1 Sub-menus
2 Return
3 Cursor
4 If an arrow is shown, it indicates that there are further sub menus

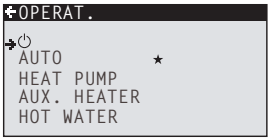
Use the + and - buttons to move the cursor between the sub-menus. Use the right button to select a sub-menu. Use the left button to go back in the menu.

5 Settings and adjustments

An qualified installer sets the heat pump's basic settings upon installation. Described below are the adjustments that may be made by the installer/user.

Do not change controller settings without firstly understanding the impact of the change. Make a note of the default setting.

5.1 Setting the operating mode



1. Open the OPERAT. menu in the INFORMATION menu. The asterisk shows the current selection.
2. Select the new mode using the + or – button.
3. Press the right button once to confirm the choice.
4. Press the left button twice.

The following operating modes can be selected:

Operating mode	Meaning
(OFF)	The installation is fully switched off. This mode is also used to acknowledge certain alarms.
AUTO	The heat pump and the immersion heater are automatically controlled by the control system.
HEAT PUMP	The control system is controlled so that only the heat pump unit (compressor) is allowed to operate. In this operating mode, peak-heating charging (anti-legionella function) of the hot water will not run because the immersion heater is not used.
ADD. HEATER	The control system only permits the immersion heater to be in operation.
HOT WATER	In this mode the heat pump only produces hot water; no heat is directed to the heating system.

Warning

If the operating modes OFF or HOT WATER are to be used for long periods during the winter, the water in the heating system must be drained, otherwise there is a risk of damage caused by the water freezing.

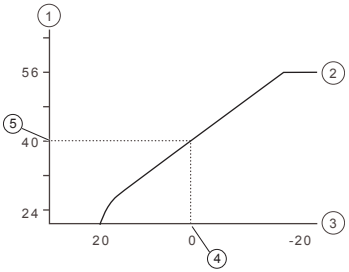
5.2 Adjusting the indoor temperature

The indoor temperature is adjusted by changing the heat pump's heat curve. This curve is the control system's tool for calculating the correct supply temperature of water for the heating system. The heat curve is a graph that compares the outdoor temperature with the supply temperature. A colder outdoor temperature results in more heat being supplied to the heating system. The heat curve will be adjusted during installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather condition. A correctly set heat curve reduces maintenance and saves energy.

There are two ways of adjusting the heat curve. Using the HEAT CURVE sub-menu or by using the ROOM value.

A typical heat curve is shown below. At an outdoor temperature of 0°C the supply temperature should be 40°C. At outdoor temperatures colder than 0°C, supply water hotter than 40°C is sent out to the radiators. At outdoor temperatures greater than 0°C, supply water cooler than 40°C is sent out. When the CURVE value is increased, the heat curve will become steeper and when the value is reduced, it will become flatter.

This is the most energy-efficient and cost-efficient way to set the indoor temperature; it should therefore be used for long-term temperature settings.



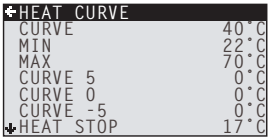
1 Supply temperature (°C)
2 Maximum setpoint value
3 Outdoor temperature (°C)
4 0°C
5 Set value (standard 40°C)

The following parameters can be adjusted:

Parameter	Description
CURVE	If the CURVE value is increased, the heat curve will become steeper; if the value is reduced, it will become flatter. Raise to increase indoor temperatures, reduce to lower indoor temperatures.
MIN	Lowest setpoint for supply temperature.
MAX	Highest setpoint for supply temperature.
CURVE 5	Used to adjust the heat curve at an outdoor temperature of +5°C.
CURVE 0	Used to adjust the heat curve at an outdoor temperature of 0°C.
CURVE -5	Used to adjust the heat curve at an outdoor temperature of -5°C
HEAT STOP	This function stops all production of heat when the outdoor temperature is equal to, or higher than, the heat stop value currently set.

High temperatures in an underfloor heating system can damage parquet floors.

Adjust the heat curve in the HEAT CURVE menu as follows:



1. Open the HEAT CURVE menu in the INFORMATION menu.
2. Select the parameter required using the + or – button.
3. Open the parameter by pressing the right button once.
4. Increase or reduce the value with the + or - button.
5. Press the left button three times.

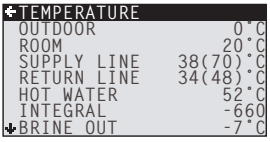
The heat curve and therefore the indoor temperature can be affected by changing the ROOM value. If the ROOM value is used to affect the system's heat curve, the heat curve does not become steeper or flatter, as it does when the CURVE value changes. Instead the entire heat curve is moved by 3°C for every degree change of the ROOM value.

For a temporary increase or decrease of the indoor temperature, adjust the ROOM value.

Change the ROOM value as follows:

1. Press either the + or - button once to open and change the ROOM value.
2. Increase or decrease the ROOM value using the + or - buttons to change the indoor temperature.
3. Wait ten seconds or press the left button once to exit the menu.

5.3 Reading off temperatures

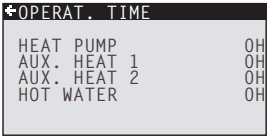


The setpoint value for the supply line and the max value of the return line are shown in brackets. The max value indicates the temperature at which the compressor is stopped. No values can be changed in this menu.

The present temperatures in the system are shown here. Temperatures are recorded and stored for 100 minutes so that they may be displayed graphically

If ROOM shows 20°C the heat curve is unaffected. If ROOM shows a higher or lower value, this indicates that the heat curve has been adjusted up or down.

5.4 Reading the operating time



HEAT PUMP shows the total time in hours that the heat pump has been in operation since installation.

AUX. HEAT 1 and 2 refer to the immersion heater power stage 3 kW and 6 kW.

HOT WATER is included in the total HEAT PUMP time and indicates the number of hours that hot water production has been running since installation.

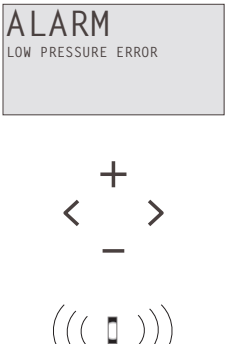
5.5 Manual defrost, outdoor unit

If the heat pump requires defrosting you can run a defrosting procedure manually from the control computer:

1. Press either the right or left button once to open the INFORMATION menu. The cursor is in the OPERATION menu option.
2. Press the down button to move the cursor to the DEFROST menu option.
3. Open the menu by pressing the right button once.
4. Press the down button to move the cursor to the MANUAL DEFROST menu option.
5. Press the right button once.
6. Press the up button once to start defrost.
7. Press the left button three times to exit the menu.

6 Regular checks

6.1 Operation check



During normal operation, the alarm indicator is lit green continuously to show that everything is OK. When the alarm is triggered, it flashes green at the same time as a text message is shown in the display.

Regularly check the alarm indicator to ensure that the installation is working correctly. In event of an alarm the heat pump will, if possible, supply heating to the house, primarily with the compressor, secondarily with the immersion heater. Hot water production will stop to indicate that a significant event has occurred.

6.2 Alarm

If an event occurs that triggers an alarm this is indicated in the display with the text ALARM and the relevant alarm message. The possible alarm messages are:

Message	Meaning
HIGH PRESSURE ERROR	The heating circuit is the heat pump's high pressure circuit. Check and, if necessary, rectify the circuit level as below. Reset the alarm as below.
LOW PRESSURE ERROR	The brine circuit is the heat pump's low pressure circuit. Check the circuit level as below. Contact the service technician.
ERR PHASE SEQ.	Can be displayed in conjunction with interference in the mains network, for example after a temporary power cut. Reset the alarm as below. If necessary, switch the power supply off for a minute or two.
Other alarm message	Reset the alarm as below. If the alarm remains, contact a service technician.

For alarms that are not reset automatically, acknowledgement is required. Acknowledge the alarm by setting the heat pump to operating mode OFF and then back to the desired operating mode.

6.3 Check the water level in the heating circuit

The system pressure of the installation must be checked once a month. The external manometer must show a value between 1-1.5 bar. If the value is below 0.8 bar when the water in the heating system is cold, the water must be topped up (applies to unvented systems). You can use normal tap water when topping up the heating system. In certain exceptional cases the water chemistry may be so poor (for example very hard water) that it is not suitable for filling the heating system. If you are unsure, contact your installer.

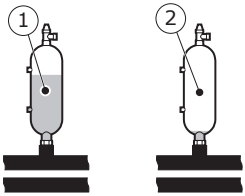
N	Do not use any additives for treatment of the water in the heating system.

N	The unvented expansion vessel contains an air-filled bladder that absorbs variations in the heating system's volume. Under no circumstances may it be drained of air.

6.4 Check the brine circuit level

The brine circuit must be filled with the correct amount of fluid otherwise operational interruptions may occur.

The brine must be topped up when the level drops so that it is no longer visible in the expansion tank.



1 Correct level
2 Level too low

During the first month of operation the brine level might drop slightly; this is quite normal. The fluid level may also vary depending on the temperature of the heat source. Under no circumstances must the fluid level be allowed to drop so far that it is no longer visible in the expansion tank.

For DHP-A Opti with pressurised brine circuit, the manometer on the expansion tank must show approximately 1.0 bar.

Always call your installer if the brine requires refilling.

6.5 Checking safety valves

The safety valves for the installation must be checked at least four times a year to prevent lime deposits clogging the mechanism.

The safety valve of the water tank protects the enclosed heater against over pressure. It is mounted on the cold water inlet line. If the safety valve is not checked regularly, there is a risk that the water tank may sustain damage. It is quite normal for the safety valve to let out small amounts of water when the water tank is being charged, especially if a lot of hot water was used previously.

The safety valves can be checked by turning the cap a quarter of a turn clockwise until water comes out of the overflow pipe. If a safety valve does not work properly, it must be replaced. Contact your installer.

The opening pressure of the safety valves is not adjustable.

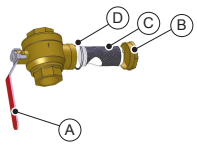
6.6 In the event of leakage

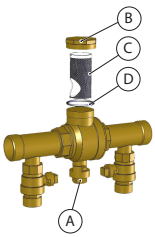
In the event of leakage in the hot water pipes between the heat pump and water taps, close the shut-off valve on the cold water inlet immediately. Then contact your installer.

In the event of leakage in the brine circuit, turn off the heat pump and call your installer immediately.

6.7 Cleaning the filters for the heating and brine circuits

N	The heat pump must be switched off at the main switch before cleaning can be started.
N	The filter must be cleaned twice a year after installation. The interval can be extended if there is evidence that cleaning twice a year is not necessary.
N	Have a cloth to hand when opening the filter cover as a small amount of water usually escapes.





1	Shut-off tap
2	Cover
3	Filter
4	O-ring

Clean the filter as follows:

1. Switch off the heat pump.
2. For the brine circuit filter - remove the insulation around the filler cock.
3. Turn the shut-off tap (A) to the closed position.
4. Unscrew the cover (B) and remove it.
5. Remove the filter.
6. Rinse the filter (C).
7. Reinstall the filter.
8. Check that the O-ring (D) on the cover is not damaged.
9. Screw the cover back into place.
10. Turn the shut-off tap to the open position.
11. For the brine circuit filter - reinstall the insulation around the filler cock.
12. Start the heat pump.

7 Default setting in the controller

The first column in the table below shows the parameters that can be adjusted by the User. The second column shows the factory settings, and the third column shows the settings made by the installer in connection with installation of the heat pump.

Parameter	Factory setting	Any customer specific settings
ROOM	20°C	
OPERAT.	AUTO	
CURVE	40°C	
MIN	10°C	
MAX	55°C	
CURVE 5	0°C	
CURVE 0	0°C	
CURVE -5	0°C	
HEAT STOP	17°C	

8 Checklist

Location

- ☐ Surface adjustment
- ☐ Drainage

Pipe installation, hot and cold side

- ☐ Pipe connections in accordance with the diagram
- ☐ Flexible hoses
- ☐ Expansion and bleed vessel
- ☐ Filter, hot and cold side
- ☐ Pipe insulation
- ☐ Open radiator valves
- ☐ Leak test, hot and cold side

Electrical Installation

- ☐ Circuit breaker
- ☐ Fuse
- ☐ Positioning of the outdoor sensor

Commissioning

- ☐ Bleeding, hot and cold side
- ☐ Settings control system
- ☐ Manual test components
- ☐ Manual test different operating conditions
- ☐ Noise check
- ☐ Function test safety valves
- ☐ Function test mixer valve
- ☐ Trimming the heating system

Customer information

- ☐ Contents of this manual
- ☐ Safety precautions
- ☐ Controller, function
- ☐ Settings and adjustments
- ☐ Regular checks
- ☐ Reference to service requirement
- ☐ Warranties and insurances

9 Installation carried out by:

Piping installation

- Date:
- Company:
- Name:
- Tel. No:

Electrical Installation

- Date:
- Company:
- Name:
- Tel. No:

System adjustment

- Date:
- Company:
- Name:
- Tel. No:

User Guide **Domestic heat pumps**

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